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Effects on Motor Vehicle Behavior of Color and Width of Bicycle Facilities at Signalized Intersections

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Summary

Research was undertaken in Christchurch, New Zealand to investigate motor vehicle behavior near bicycle facilities at signalized intersections. Motorists not keeping clear of such facilities may limit their usefulness and safety for bicyclists. The main research objective was to assess motorists' avoidance of colored facilities in comparison to uncolored ones. The research also investigated if wide combined bicycle and traffic lanes encourage drivers to queue side-by-side, thereby encroaching into bicyclist spaces.

18 sites were identified to evaluate the effect of colored surfacing and lane widths on the rate at which motorists encroach on marked bicycle spaces. The sites contained either Advanced Stop Lines (ASL) or Advanced Stop Boxes (ASB) and were a mix of colored and uncolored facilities with "narrow" and "wide" lane combinations. Manual surveys were carried out to observe the positions of motor vehicles in relation to the bicycle facilities. Four of the uncolored sites were then colored and "after" surveys conducted.

The results showed that drivers were much less likely to encroach on colored bicycle spaces in comparison to uncolored ones, particularly ASLs. Motorists were also more likely to encroach on bicycle lanes in "wide" lane combinations.

It is recommended that road agencies continue coloring new and existing bicycle facilities at intersections, with preference given to existing ASLs over ASBs and sites with wider aproaches. Traffic and bicycle lane combinations greater than 5.0 m (16½ ft) should also be avoided if separate turning traffic lanes are not present.

Study Aims

Research was undertaken in Christchurch, New Zealand (NZ) to investigate road user behavior near bicycle facilities at signalized intersections. The main objectives of the research were:

(1) Assess bicyclists and drivers' compliance with colored bicycle facilities in comparison to uncolored ones.

(2) Assess the effect of combined bicycle and traffic lane width on vehicle positioning with respect to bicycle areas - do wide traffic lanes encourage drivers to queue side-by-side, thereby encroaching into bicyclist spaces?

(3) Determine the relevance of the research outcomes for bicycling design standards.

Typical Intersection Bicycle Facility

Study Location: Christchurch, New Zealand

Facts:

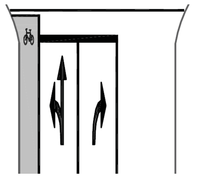
- New Zealand's second largest city (pop. 380,000)
- ~7% of Commuters cycle to work

Extensive Bicycle Network (>130km)

- On-road bike lanes
- Off-road bicycle paths
- Specific intersection facilities

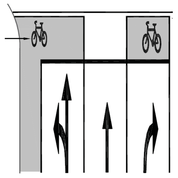
Note: in NZ, vehicles drive or ride on the **left-hand** side of the road.

Types of Facilities Investigated



Advanced Stop Line (ASL)

- Bicycle lane is extended slightly in front of the traffic lane limit lines
- Improves bicyclist visibility particularly for turning motorists



Advanced Stop Box (ASB)

- An area is located directly in front of the traffic lane
- Provides more queuing space and assists with right-turning

Investigation Method

Survey of Motor Vehicle Encroachments

"Partial" Encroachments

- A small (but practically noticeable) part of a motor vehicle is on the marked bicycle space - a bicyclist will still be able to use the remaining space
- Could result in some bicyclists resorting to using pedestrian facilities

Example of Partial Encroachment

"Full" Encroachments

- Where a motor vehicle stops or drives whilst covering the whole bicycle space
- Bicyclist has to find an alternative route or waiting position
- ASB Full encroachment could be in side lane or front box

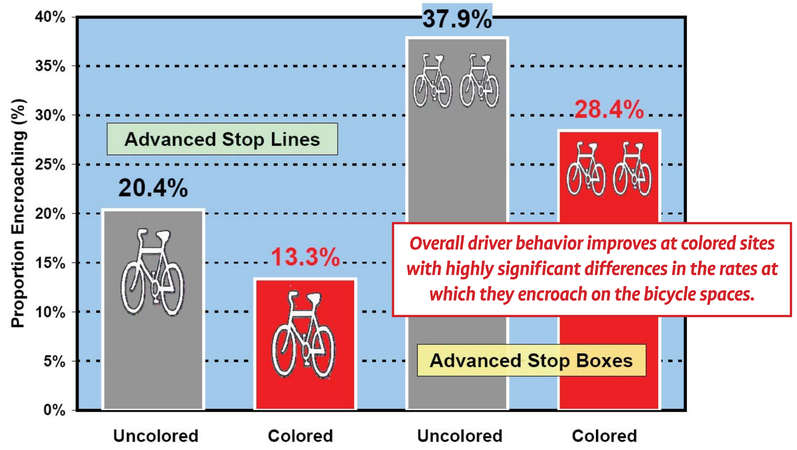
Example of Full Encroachments (side and front)

18 Sites Selected (various widths)

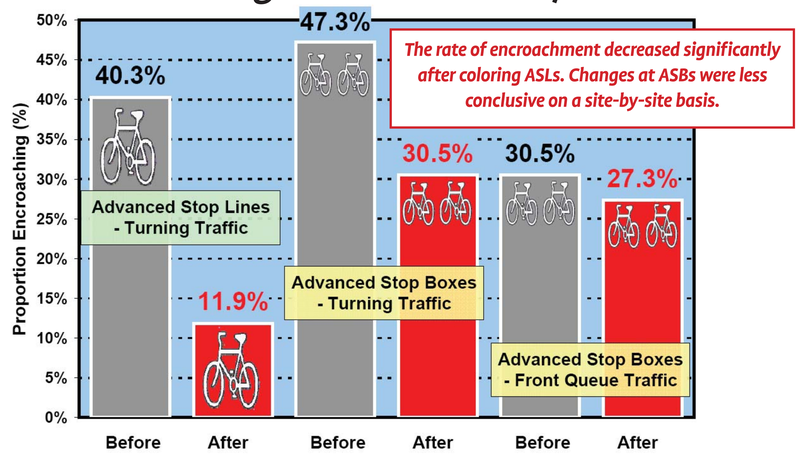
- 6 sites with ASLs but no colored surfacing
- 3 sites with ASLs and colored surfacing
- 6 sites with ASBs but no colored surfacing
- 3 sites with ASBs and colored surfacing

Four uncolored sites (2 ASLs/ASBs each) colored and subsequently re-surveyed ("before/after sites")

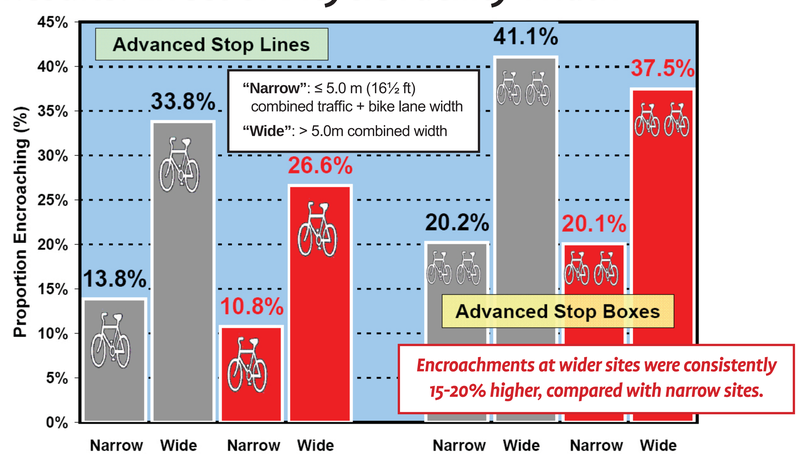
Results: Effect of Bicycle Facility Color



Results: Coloring Facilities - Before/After Sites



Results: Effect of Bicycle Facility Width



Key Recommendations

- Road agencies should continue coloring new and existing bicycle facilities at signalized intersections.
- All other things being equal, preference should be given to coloring existing ASL sites before ASB sites.
- All other things being equal, preference should be given to coloring existing sites with wider aproaches before narrower ones, given the likely encroachment problems already at the former.
- At intersections, adjacent traffic and bicycle lane combinations greater than 5.0 m (16½ ft) should be avoided.

Research Report for Details:

Mangundu E. (2009). *The Effects of colouring cycle spaces on motor vehicles and bicycles positioning behavior at signalised intersections in Christchurch*. ENCI682 Research Project Report, Department of Civil & Natural Resources Engineering, University of Canterbury, NZ.

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